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## PROPERTY RIGHTS IN OUTER SPACE

KURT ANDERSON BACA\*

DURING the past thirty years, Man took his first steps toward freeing himself from the confines of his birthplace, Earth. The advanced, industrialized nations of the world visited the Moon, probed the planets, and established a continuous scientific, commercial, and military<sup>1</sup> presence in the orbits of the earth. Planned activities for the future include a permanently manned multinational earth orbiting space station<sup>2</sup> and renewed manned plane-

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<sup>1</sup> In its preamble, the principal treaty governing outer space suggests that outer space be used for peaceful purposes. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 (entered into force with respect to the United States on Oct. 10, 1967) [hereinafter Outer Space Treaty]. However, in its substantive sections, the Outer Space Treaty prohibits only the placement of weapons of mass destruction in earth orbit. *Id.* at art. IV, para. 1. It has not been construed to include military reconnaissance, communications or navigation satellites. It probably does not include conventional weapon systems not deemed to be capable of mass destruction. "While some countries wished the treaty to be more comprehensive, the U.S.S.R. and the United States, which had submitted draft treaties leading to the agreed text, were not willing to go beyond what was finally agreed." Nandasiri Jasentuliyana and N.R. Chipman, *The UN and Space Weapons* 7 [No. 4] Harvard International Review 32 (Jan./Feb. 1985).

<sup>2</sup> "[T]he United States, Canada, Japan, and the nine member states of the European Space Agency (ESA), [which includes the Kingdom of Belgium, the Kingdom of Denmark, the French Republic, the Federal Republic of Germany, the Italian Republic, the Kingdom of the Netherlands, the Kingdom of Norway, the Kingdom of Spain, and the United Kingdom of Great Britain and Northern Ireland] became partners in an intergovernmental venture to launch a permanently inhabited civil space station." Mary B. McCord, Note, *Responding to the Space Station Agreement: The Extension of U.S. Law into Space*, 77 GEO. L.J. 1933, 1933-34 (1989) (citing Agreement on Cooperation in the Detailed Design, Development, Operation, and Utilization of the Permanently Manned Civil Space Station, *done*

tary exploration.<sup>3</sup> Official groups have further recommended more intense development of space resources, including "large-scale mineral recovery activities in space."<sup>4</sup>

Celestial bodies, including the Moon and certain Earth-approaching asteroids, which may be accessible for exploitation in the near future, are rich in materials that would be useful for a variety of purposes on Earth and in outer space. Within decades,<sup>5</sup> man could be able to utilize the resources of the Moon to support space exploration, manufacturing in space of items for use on Earth, and in the industrialization of the Moon and the orbits of the Earth. A congressional committee, in assessing the space resources that could be covered by the Moon

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Sept. 29, 1988, and Arrangement Concerning Application of the Space Station Agreement Pending Its Entry into Force, *done* Sept. 29, 1988); President Reagan's State of the Union Address, 20 WEEKLY COMP. PRES. Doc. 87, 90 (Jan. 25, 1984) (calling for development of permanent manned space station for scientific, commercial and industrial use).

<sup>3</sup> National Aeronautics and Space Administration Authorization Act, Fiscal Year 1991, Pub. L. No. 101-611, 104 Stat. 3190 (1990). Section 102(15) states that it is to be the policy of the United States to "seek innovative technologies that will make possible advanced human exploration initiatives, such as the establishment of a lunar base and the succeeding mission to Mars." Section 103(a)(1)(E) authorizes \$337,200,000 in Fiscal Year 1991 for use in research and development for planetary exploration. This was a compromise between the Senate and a more expansive House authorization. *See* NASA Multiyear Authorization Act of 1990, H.R. 5649, 101st Cong., 2d Sess. (1990) (calling for authorization of \$444 million in Fiscal Year 1992, \$649 million in Fiscal Year 1993 for the human exploration initiative, the goals of which are to establish a permanent base on the moon and travel to Mars); *see also* David C. Morrison, *NAT'L J.*, Aug. 19, 1989, at 2117 (President Bush calls for return to Moon and manned mission to Mars).

<sup>4</sup> Grier C. Raclin, *From Ice to Ether: The Adoption of a Regime to Govern Resource Exploitation in Outer Space*, 7 *Nw. J. INT'L L. & Bus.* 727, 728-29 (1986) (United States National Commission on Space "recommended that steps necessary to undertake the development of . . . extraterrestrial resources begin at once" and "called for the establishment of pilot mining and production facilities on the Moon by the year 2007"). *See also* Fred Kosmo, Note, *The Commercialization of Space: A Regulatory Scheme that Promotes Commercial Ventures and International Responsibility*, 61 *S. CAL. L. REV.* 1055, 1056 (1988) (discussing intensifying commercialization of space and the feasibility of mining celestial bodies).

<sup>5</sup> STAFF OF SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION, 96TH CONG., 2D SESS., *AGREEMENT GOVERNING THE ACTIVITIES OF STATES ON THE MOON AND OTHER CELESTIAL BODIES*, Part 4, 417 (Comm. Print 1980) ("space manufacturing based on lunar material utilization could conceivably be decades away") [hereinafter MOON TREATY REPORT].

Treaty<sup>6</sup> stated, in part, that

Lunar surface materials are a possible future source of raw material which could be processed in space to produce structural metals, oxygen, silicon, glass, and ceramic products. Lunar metals have potential for construction purposes. Titanium, a strong light metal which can withstand high temperatures, is in much demand for the aerospace industry today and may have a number of uses in space construction. Processing lunar titanium may be easier (and possibly cheaper) than processing Earth titanium, for titanium processing requires high temperatures, a vacuum, and large quantities of energy. Lunar silicon could be used to build photovoltaic systems in orbit or on the Moon. The oxygen from lunar materials could be combined with hydrogen from the earth to make water and could also be used in making an atmosphere for workers in space.<sup>7</sup>

The report goes on to state that "most of the requirements for human activity and industry in space except water and hydrogen, are available at the lunar surface."<sup>8</sup> The Earth-approaching asteroids are also potential sources of useful materials, including water, and the exploitation of the resources of Earth-approaching asteroids may be even more attractive than those of the Moon for the provision of materials for space manufacturing.<sup>9</sup>

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<sup>6</sup> Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, G.A. Res. 34/68, 34 U.N. GAOR, 34th Sess., Supp. No. 46, at 77, U.N. Doc. A/34/664 (1979) [hereinafter Moon Treaty].

<sup>7</sup> MOON TREATY REPORT, *supra* note 5, at 415. Currently, interest is focused on the presence of Helium 3 on the Moon's surface (as a product of solar radiation bombardment), a substance not found on Earth but valuable in fusion energy generation schemes.

<sup>8</sup> *Id.* at 416.

<sup>9</sup> *Id.* at 417-18 ("economics of asteroidal retrieval may be more favorable than lunar resource retrieval by about an order of magnitude due to additional requirements imposed on lunar materials retrieval"). See John Davies, *Mission to the Asteroids*, NEW SCIENTIST, Nov. 17, 1983, at 490 (earth orbit crossing asteroids "may represent a future source of raw materials"); Lewis and Mainel, *Asteroid Mining and Space Bunkers*, DEFENSE SCIENTIST, June 1983, at 33 (1000-2000 near earth asteroids with diameters greater than 100 meters; ten percent "energetically more accessible than the surface of the Moon"). Asteroids located in the belt between Mars and Jupiter are also thought to be potentially useful. They are "thought to contain a rich variety of materials in sufficient quantities to 'support a civilization

Several reasons are advanced for the exploitation of these resources.<sup>10</sup> First, and probably most immediate, would be to realize the cost savings inherent in the use of materials from space in the manufacture of products whose use will also be in space. The cost of lifting similar materials from Earth could be reduced by obtaining the materials directly from the Moon or the asteroids. The amount of energy required to lift a given mass from the Moon into space is one-twentieth of that required to lift the mass from the Earth. The energy required to lift the mass from an asteroid is even lower.<sup>11</sup> Second, there are a group of related factors. The raw materials from space could serve as an alternative source of those materials that have, or may become, depleted on Earth, or whose price has become economically, politically, or environmentally too high. These factors are often interrelated. Thus, while there is little likelihood of the immediate depletion of any particular raw material on Earth, accessible reserves of a nation may become depleted requiring use of a lower grade source of the material or a substitute. This could result in higher direct costs to obtain the material and higher environmental costs in mining or processing the material.<sup>12</sup> The depletion of reserves could also

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many thousand times larger than the Earth's population.' " Raclin, *supra* note 4, at 728 (citing *NAT'L COMM'N ON SPACE, PIONEERING THE SPACE FRONTIER* 3, at 88 (1986)).

<sup>10</sup> Some authors are quite emphatic. "The development of space resources is not being pursued simply for the sake of accomplishment nor is it merely a full-employment program for the world's scientists. Rather, an immediate and genuine need exists for finding alternative sources to replace the natural resources currently found on earth." Douglas A. Barritt, Note, *A "Reasonable" Approach to Resource Development in Outer Space*, 12 *Loy. L.A. INT'L & COMP. L.J.* 615, 618 (1990). Others more restrained. "There may be significant economic, environmental, and political incentives for utilization and exploitation of extraterrestrial resources." *MOON TREATY REPORT*, *supra* note 5, at 418.

<sup>11</sup> *MOON TREATY REPORT*, *supra* note 5, at 418-19. Of course a complete economic analysis would also require figuring the cost of mining the materials on the Moon or an asteroid. Thus, the savings in lifting the material may not all be realized when the added costs in space are included. However, a further savings may be realized by utilizing raw materials from space and avoiding the lift from earth by internalizing the environmental costs of pollutants discharged in the lifting of the materials from Earth. *See id.* at 419.

<sup>12</sup> The Moon Treaty Report gives the example of iron ores to illustrate.

lead to increasing political tension with third world producers of raw materials and perhaps lead those states to attempt to exact an unacceptable political price from the industrialized states.<sup>13</sup>

Eventually, it seems, the development and exploitation of space resources will become necessary. It has been suggested that “[t]he quality of America's future social and economic welfare is inextricably intertwined with the successful commercialization of space by American private enterprise.”<sup>14</sup> The costs of exploiting space resources will, however, be quite high. While there are “no insurmountable technical problems which should prevent” such exploitation,<sup>15</sup> the risks undertaken by any government or commercial enterprise endeavoring to use space resources are very great. The risks include the possibility of technical problems as well as all of the risks that usually face a new enterprise.<sup>16</sup> In addition, the potential enterprise must contend with the uncertain state of the law in outer space, which makes the status of its interests in space uncertain, even if that interest should prove to be profitable. “It would seem equally clear that, without law in this area, no country, government, or commercial enterprise is likely to undertake the substantial risks and

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“[T]hough the Earth has plentiful iron reserves, the reserves of easily accessible or high-grade deposits which can be exploited at low environmental and financial cost are decreasing.” MOON TREATY REPORT, *supra* note 5, at 419. Another example may be the diminishing supply of energy resource reserves. The use of coal or nuclear fuels as a substitute for oil and natural gas poses financial and environmental costs (as well as political costs to obtain the existing oil from those states which have large reserves). Barritt, *supra* note 10, at 618-22. Space solar satellites could alleviate the energy problem as could space sources of radioactive materials and space dumping of used radioactive materials. See MOON TREATY REPORT, *supra* note 5, at 420.

<sup>13</sup> MOON TREATY REPORT, *supra* note 5, at 419; Barritt, *supra* note 10, at 619.

<sup>14</sup> Kosmo, *supra* note 4, at 1056.

<sup>15</sup> MOON TREATY REPORT, *supra* note 5, at 419-20.

<sup>16</sup> In the extraction of natural resources the risk of a ‘dry hole’ is always great. Furthermore, any resource extraction enterprise must still compete with Earth sources, subjecting that enterprise to the possibility of new competitors or uncertain price competition from existing producers. In manufacturing, the risks associated with untried processes or operations with high initial capital costs are also great.

costs involved in such exploitation."<sup>17</sup>

What is needed is certainty in the law. Furthermore, if space is to be successfully commercialized by "American private enterprise," the law should be compatible with such a system. The successful development of space resources requires meaningful property rights, allocation of those rights and recourse to some power for the enforcement of those rights. To date, the allocation of rights to geostationary orbit positions provides the only precedent in space that is even remotely analogous to the situation that might be faced in the exploitation of other space resources. The purpose of this note will be to evaluate the adequacy of the developing law of property in space as reflected in treaties, custom, and practice in the allocation of geostationary orbit positions. To the extent that this body of law is inadequate, this note suggests necessary remedies. These remedies provide a suggested viewpoint and process for the development of property law rather than specific formulations of legal rights and remedies.

Part I of the note considers the role of property rights in the development of earthly resources. This will include a discussion of certain essential property rights for efficient utilization of resources and a discussion of the problem of equitable allocation of those rights. Part II of the note examines the current status of space law and property. Treaties and customary law in space relating to property are first evaluated. Next, the developing 'law' relating to the allocation of geostationary orbit positions is discussed. Included in this section will be a discussion of the geostationary orbit, its importance and the institutions and processes regulating its use. Finally, Part II concludes with an evaluation of the adequacy of the existing space law, including the law on allocation of geostationary orbit, for the efficient and equitable development of space resources. Part III presents an alternative approach to resource allocation in space—including a listing

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<sup>17</sup> Raclin, *supra* note 4, at 730.

of the necessary property rights, allocation of those rights, and, most importantly, the guaranteeing of those rights. A recommendation that the issue of sovereignty be reconsidered in space, as some form of sovereignty is an absolute necessity to the guarantee of the property rights required for the development of space resources, is advanced. Finally, Part III concludes with the suggestion that the course of man's history is continuous and, regardless of high-minded sentiments, the extension of that history into space is inevitable.

## I. PROPERTY RIGHTS AND THE DEVELOPMENT OF RESOURCES

This part of the note first examines the fundamental rights associated with a property interest. A "fundamental right" in this context is a right whose existence is necessary for the equitable and efficient utilization of resources. Along with the examination of fundamental rights, the critical issue of the initial allocation of property interests is considered in the first section of this part.<sup>18</sup> The second section of this part examines whether the

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<sup>18</sup> See *infra* part I.A. This examination, it must be admitted, takes a decidedly Anglo-American view of property. It is beyond the scope of this paper to justify this position; however, particularly at this point in the history of man's unfortunate flirtation with ideology, it should be obvious to the intelligent observer of the political and economic condition of Eastern Europeans (and of many developing nations in other regions) that the utopian promises of the philosophers of the late 18th and 19th centuries and their revolutionary followers were pernicious in reality. The political tyranny and economic ruin that accompany the quest for utopian ends is manifest in the history of the twentieth century. The strength of Anglo-American property law is its pragmatic reliance on the experience of man, rather than on his abstract rationalism or romantic fantasies, and its development through the thoughtful resolution of ripened problems—those with real, rather than merely postulated or anticipated contexts. See discussion *infra* part III.

This is not to say that Anglo-American institutions are necessarily required for the establishment of these rights. Indeed, where civil law traditions recognize analogous rights societies flourish. Again, it is beyond the scope of this paper to justify this assertion. It really appears obvious. Even critics of the West seem not to deny the superiority of the rights and advantages of Western societies so much as they argue that things might be so much better. This perhaps may be the case, but the history of revolutions has indicated that things may certainly be much worse. So much worse that ideological civilization is more likely to represent an oxymoron than any tolerable arrangement for human society. See *infra* notes 62-

rights and principles of property necessary for resource development on Earth will be needed for the equitable and efficient development of the resources of outer space.

### A. PROPERTY LAW AND ALLOCATION

#### 1. *Property Powers, Social Efficiency, and the Role of the Sovereign*

It is fundamental in property law that property rights are defined, not against the thing that is the subject of the property law, but against the rest of the world.<sup>19</sup> The use of traditional Hohfeldian relationships illustrates the sense of this proposition.<sup>20</sup> A right supposes a correlative duty.<sup>21</sup> Thus the establishment by legislatures or courts of rights against a thing would be pointless since it is useless to establish the correlative duty in the thing to the one who possesses the right. No degree of exertion by the state is likely to result in a submission by the thing to any laws other than those of physics. The state can, however, enforce the duties it imposes on citizens.<sup>22</sup> The law of property is regulation of the behavior of persons relative to one another with respect to the various things that persons may possess. Indeed, if property is recognized as the rights of persons vis-à-vis other persons rather than

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66 and accompanying text (discussing the relevance of the preceding observations as they relate to a legal regime for resource utilization in space).

<sup>19</sup> Richard A. Epstein, *Possession as the Root of Title*, 13 GA. L. REV. 1221, 1221 (1979). "The system itself presupposes that there are rights over given things that are vested in certain individuals within that system. And the system knows full well that these property rights in things are defined not against the thing, but over the thing and against the rest of the world." "Property rights are, of course, a species of relationships between people." Alex Kozinski, *Introduction: Of Profi-gacy, Piracy, and Private Property*, 13 HARV. J.L. & PUB. POL'Y 17, 19 (1990).

<sup>20</sup> See Wesley N. Hohfeld, *Some Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 23 YALE L.J. 16, 228-59 (1913) (discussing fundamental legal relations and correlations between rights and duties).

<sup>21</sup> *Id.* at 31.

<sup>22</sup> This discussion will also suggest the pointlessness of creating rights in persons (individual or corporate) or in states when the body creating that right has no power—or duty—to ensure adherence to the correlative duty by a meaningful community. See *infra* note 182 and accompanying text (discussing the necessity of a sovereign power to a functioning system of property rights).

things, it is easy to see that property cannot exist without law.<sup>23</sup>

The rights of property normally confer three powers<sup>24</sup> on the holder of these rights: the power to exclude others from the property or to exclusive possession; the power to use the property; and the power to transfer the property to another of his choosing at the time of his choosing (the power of disposition).<sup>25</sup> Professor Epstein neatly summarizes the economic justification for the inclusion of each of these rights in an efficient system of property.<sup>26</sup> The power to exclude is the starting point that makes the pos-

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<sup>23</sup> This idea is expressed in the works of the great political philosophers. For example, Locke, while suggesting the possibility of property before the existence of the state as a matter of natural law, admits that the state is necessary to the existence of property rights. JOHN LOCKE, *TWO TREATISES OF GOVERNMENT, SECOND TREATISE* 390, ¶ 123 (Peter Laslett ed., student ed. 1988) (3d ed. 1698). "Why will he . . . subject himself to the Dominion and Controul of any other Power? To which 'tis obvious to Answer, that though in the state of Nature he hath such a right, yet the Enjoyment of it is very uncertain, and constantly exposed to the Invasion of others. . . . And 'tis not without reason, that he seeks out, and is willing to joyn in Society with others who are already united, or have a mind to unite for the mutual *Preservation* of their Lives, Liberties, and Estates, which I call by the general Name, *Property*." *Id.* And, Rousseau asserts that in the social contract (that is, the state), man "acquires civil liberty and the proprietorship of all he possesses." JEAN ROUSSEAU, *THE SOCIAL CONTRACT* 19 (Charles Frankel ed. 1947) (based on anonymous translation published in 1991). "Property and law are born together, and die together. Before laws were made there was not property; take away laws, and property ceases." JEREMY BENTHAM, *THEORY OF LEGISLATION: PRINCIPLES OF THE CIVIL CODE* 113 (C.K. Ogden ed. & Richard Hildreth trans. 1931).

This notion is also reflected in judicial decisions. For example, Justice Jackson stated "only those economic advantages are 'rights' which have the law back of them . . . whether it is a property right is really the question to be answered." *United States v. Willow River Power Co.*, 324 U.S. 499, 502-03 (1945).

<sup>24</sup> Using the Hohfeldian terminology, the grant of a power creates a correlative liability in other parties to that power. Hohfeld, *supra* note 20, at 44. Thus if A has the power to exclude B from his property, B is liable to the power of A and may be excluded. *See id.* It follows that, if A exercises the power as a right, the grantor of the right has the duty to uphold that right by giving effect to the power.

<sup>25</sup> RESTATEMENT (FIRST) OF PROPERTY § 1 (1936); Richard A. Epstein, *Property and Necessity*, 13 HARV. J.L. & PUB. POL'Y 2, 3 (1990) (citing 12 OXFORD ENGLISH DICTIONARY 639 (2d ed. 1989)). *See* GEORGE W. HEGEL, *PHILOSOPHY OF RIGHT* 46, ¶ 53 (T.M. Knox trans., 1949) (presenting an analogous relation of the 'will' to the 'thing' in property consisting of taking possession, use, and alienation). *See also infra* notes 42-59 and accompanying text (discussing manner of obtaining property right in the first instance and the equity of such arrangements).

<sup>26</sup> Epstein, *Property and Necessity*, *supra* note 25, at 3-4.

sessor the arbiter of access to property. This power is negative in effect, giving the holder of the property security against others but not in itself giving the holder positive powers with respect to the property.<sup>27</sup> It is enabling, nevertheless, in the sense of securing the holder's expectations in the property should he be given power to affect positive developments or dispositions of the property. Exclusivity secures the fruits of the positive powers. By so doing, this negative power encourages the holder of the property rights to take action and to invest time and resources in the property as allowed by the positive powers.<sup>28</sup>

As Professor Epstein points out, however, “[i]f we stopped with possession . . . [t]he world would remain a tundra, in which [the holder of the right] could keep [his] own place on the barren square of the checkerboard.”<sup>29</sup> The property holder must also have the power to use the property.<sup>30</sup> From this power arises production. Production serves the needs of the owner and, in many instances, will result in a surplus that benefits society.<sup>31</sup>

The final positive power inherent in an efficient system of property rights is the power to dispose of the property as desired. By this power, properties may be exchanged in a way that allows holders of property to maximize their utility in the property.<sup>32</sup> By maximizing in some measure

<sup>27</sup> *Id.* at 3.

<sup>28</sup> Thus the holder is allowed to enjoy the benefits of his other rights. Locke argued that the securing of this benefit, that is, protecting the holder of the right against the “invasion of others,” was the end (that is, purpose) of civil society and government. *Locke, supra* note 23, at 350.

<sup>29</sup> Epstein, *Property and Necessity*, *supra* note 25, at 3.

<sup>30</sup> It has been argued by political philosophers that the justification for possession, that is, the power to exclude, is found in productive use. “As much land as a Man Tills, Plants, Improves, Cultivates, and can use the Product of, so much is his Property.” *LOCKE, supra* note 23, at 290.

<sup>31</sup> See *infra* note 53 (quoting Locke on the societal benefit of surplus production).

<sup>32</sup> See Epstein, *Property and Necessity*, *supra* note 25, at 4-5. The measure of utility being at the discretion of each party. Regardless of the measure used, the utility of each may be related to increasing the level of well-being (in some way) for each party. This assumes that the exchange was made in the familiar ‘arms-length

social satisfaction, this three power system may be said to be efficient. Taken altogether, the property system consisting of these three powers would

necessarily have a self-generating capacity with each successive exchange or transfer. These private, decentralized, voluntary transactions, enforced by a . . . state, would generate more by way of gains than it would produce by way of losses. Through repetitive interaction, [society] would move to higher and higher levels of social satisfaction. . . .<sup>33</sup>

The common law reflects each of these powers.<sup>34</sup> The power to exclude is reflected in the common law of trespass.<sup>35</sup> The power to use is reflected in the common law of nuisance, which "is essentially the common-law response against strangers who interfere with the use of property."<sup>36</sup> Finally, the power of disposition is protected in the law of contracts and in the torts of interference with an advantageous relationship and defamation.<sup>37</sup>

These powers are not absolute. Political philosophers commonly assert that the price paid for securing the right to property through the state was a sacrifice of the absolute, though insecure, dominion over property that an individual might achieve alone.<sup>38</sup>

*The . . . Power . . . of doing whatsoever he thought fit for the Preservation of himself . . . he gives up to be Regulated by Laws made by the Society, so far forth as the preservation of himself and the rest of that Society shall require; which Laws of the Society in many things confine the liberty he had by the Law of Nature.<sup>39</sup>*

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transaction' leading to an acceptable accommodation by a willing seller and a willing buyer. *See id.*

<sup>33</sup> *Id.* at 4.

<sup>34</sup> *Id.* at 4-5.

<sup>35</sup> *Id.* at 4.

<sup>36</sup> *Id.* at 5.

<sup>37</sup> *Id.* In explaining the role of defamation, Professor Epstein suggests that "[d]efamation does not protect 'reputation' in the abstract; it protects advantageous relationships against interference by *misrepresentation*." *Id.*

<sup>38</sup> *See id.* at 4; *LOCKE, supra* note 22, at 352-53.

<sup>39</sup> *LOCKE, supra* note 23, at 352-353. "Man loses by the social contract his *natu-*

In theory that sacrifice may be complete.<sup>40</sup> Locke suggests a more limited view of the state: the property holder sacrifices only as much power as is necessary for the efficient and equitable functioning of society.<sup>41</sup> Thus in the common law there exist exceptions to trespass limiting the power to exclude, limitations on the liability of persons interfering with possession, and exceptions to nuisance limiting the ability of property holders to use property as they wish, etc.<sup>42</sup> In the public sphere, the state has the power to regulate use and disposition and the power of eminent domain.<sup>43</sup> However, the powers must not be so restricted as to lose their meaning and effect in the social economy.<sup>44</sup>

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*ral liberty, and an unlimited right to all which tempts him, and which he can obtain; in return he acquires civil liberty, and proprietorship of all he possesses.*" ROUSSEAU, *supra* note 23, at 19.

<sup>40</sup> Hobbes suggested the entire power over property belonged to the state:

The Distribution of the Materials . . . is the constitution of *Mine*, and *Thine*, and *His*; that is to say, in one word *Propriety*; and belongeth in all kinds of Common-wealth to the Sovereign Power. For where there is no Common-wealth, there is (as hath been already shewn) a perpetuall warre of every man against his neighbour; And therefore every thing is his that getteth it, and keepeth it by force; which is neither *Propriety* nor *Community*; but *Uncertainty*.

THOMAS HOBES, *LEVIATHAN* 171 (Richard Tuck ed., 1991) (1651).

<sup>41</sup> LOCKE, *supra* note 23, at 352.

<sup>42</sup> See Epstein, *Property and Necessity*, *supra* note 25, at 6-7. He goes on to argue that the exceptions produce a distribution of rights superior to that which would exist in the absence of the exceptions. *Id.* at 8.

<sup>43</sup> Stephen A. Siegel, *Lochner Era Jurisprudence and the American Constitutional Tradition*, 70 N.C. L. REV. 1, 26 n.112 (1991). In the United States such regulation is subject at least to the constitutional limitation that any regulation be rationally related to a permissible government purpose under the Due Process Clause of the Fifth Amendment of the Constitution. See *Planned Parenthood v. Casey*, 112 S. Ct. 2791, 2801 (1992). In recent years this requirement has been easily satisfied, admitting an argument that the Hobbesian formulation holds sway in this country. But, under the same Amendment, any action deemed to be a taking of the property requires public purpose and payment of just compensation to the former holder of the property thereby limiting the government in a fashion. U.S. CONST. amend XIV; see *Duquesne Light Co. v. Barasch*, 488 U.S. 299, 308 (1939).

<sup>44</sup> See Jeremy Paul, *The Hidden Structure of Takings Law*, 64 S. CAL. L. REV. 1393, 1423-25 (1991). This consideration is dictated by efficiency. The present state of Eastern European economies is a practical argument against central planning implicit in the total surrender of power to the state.

## 2. *Property Powers and Equity*

The equity of the three power property right system as described is supported in one sense by its economic efficiency. In the aggregate, such a system theoretically produces the greatest level of social satisfaction achievable with a given pool of property. Each holder will develop his property to his greatest satisfaction, secure in the knowledge that his investment will be protected by his power of possession. If another distribution exists which results in higher aggregate satisfaction, those persons may seek each other out and dispose of their property interests to obtain that greater satisfaction. In reality, arguably, imperfections exist in the market and in property regulation which prevents the achievement of any theoretical maximum. One may agree with this argument and still note that the experience of the industrialized world indicates that generally higher levels of overall satisfaction exist in those societies that have continued to maintain the property right powers.

The system is equitable in reality as well. First, the maximizing of social satisfaction is not an inequitable end. Second, with respect to the means, whatever inequities may inhere in a system where the powers to possess, use, and dispose were absolute are mitigated by the exceptions to those powers developed through history as reflected in the common law and by regulation.<sup>45</sup> Equity is also addressed by the arguments of the natural rights philoso-

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<sup>45</sup> Regulation, being based on hypothetical results that are desired by the government, is probably less reliable and more subject to abuse than the common law which was developed in the adjudication of factually real situations. As far as regulation is itself regulated by constitutional adjudication that considers real disputes and draws on the case law the dangers to efficiency and equity posed by regulation are mitigated.

Without a doubt though, regulation is problematic. “[T]he progression from courts slighting property rights in the service of the general welfare to governments abrogating all property rights in the name of social justice seems to be . . . a slippery slope.” ELLEN F. PAUL, PROPERTY RIGHTS AND EMINENT DOMAIN 191 (1987).

One check on the slippery slope may be the existence of multiple, competitive, states. States choosing inefficient courses of action, such as usurpation of property rights, will be subject to the presence of internal and external pressures to

phers, as will be seen in the following presentation.<sup>46</sup>

### 3. *Initial Allocation of Property*

There still remains the problem of the initial allocation of property rights. This problem is of critical importance in any discussion of unclaimed property such as outer space.<sup>47</sup> With regard to regions already populated, the initial allocation of property is often criticized. Even if it is "decided that ownership is necessary to create effective incentives for the development and improvement of property" such "justifications for ownership do not solve the more particular question of how given bits of property are matched with given individuals."<sup>48</sup>

Locke took the position that 'first possession' or first use established the right to exclude or title to property.

Whatsoever then he removes out of the State that Nature hath provided, and left it in, he hath mixed his *Labour* with it, and joyned to it something that is his own, and thereby makes it his property. It being by him removed from the common state Nature placed it in, hath by this *labour* something annexed to it, that excludes the common right of other Men. For this *Labour* being the unquestionable Property of the Labourer, no Man but he can have a right to what that is once joyned to . . . .<sup>49</sup>

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restore those rights as they compete with efficient states. This argument should apply both to states in our federal system and to states in the international system.

<sup>46</sup> [A philosophical defense of property rights] has as its core the concept of self-ownership; that is, that each person has the exclusive right to the use, enjoyment, and disposition of his own body. What follows from this is that he may exclude others from directing the uses to which his body will be put or from appropriating parts of his body. From this principle, I would generate a nearly inviolate right to possess, use, dispose of, and exclude others from both the personal and real property . . . previously unowned. . . [I]t would be limited by the traditional "sic utere" doctrine: Property may not be used in a way that deprives others of the use of their property.

Ellen F. Paul, *Natural Rights and Property Rights*, 13 HARV. J.L. & PUB. POL'Y 10, 10 n.1 (1990).

<sup>47</sup> Initial allocation is also a critical problem in those states that are seeking to revert to a system of property rights after a long period of collective ownership.

<sup>48</sup> Epstein, *Possession as the Root of Title*, *supra* note 19, at 1220.

<sup>49</sup> LOCKE, *supra* note 23, at 288. The labor referred to by Locke need not be

His justification for first possession arises from natural law. A basic proposition of this natural law is that "every Man has a *Property* in his own *Person*. This no Body has any Right to but himself. The *Labour* of his body, and the *Work* of his Hands we may say, are properly his."<sup>50</sup> To deprive a man of the fruits of his labor or investment would be unjust. Furthermore, first possession was not unjust to any other man. "Nor was this *appropriation* of any parcel of *Land*, by improving it, any prejudice to any other Man, since there was still enough, and as good left; and more than the yet unprovided could use."<sup>51</sup> Locke assumed that the appropriation occurred in a period without scarcity; however, he did not invalidate the appropriation when in later periods scarcity began to appear.

Locke has been criticized for failing to establish the "prior *right* (good against the entire world) to perform the labors upon which the claim for subsequent entitlement rests."<sup>52</sup> Yet, this is not entirely fair to Locke. The right to possession is based upon the industriousness of the claimant and the right rests on the benefit to society of this possession.

God gave the World to Men in Common; but since he gave it them for their benefit, and the greatest Conveniences of Life they were capable to draw from it, it cannot be supposed he meant it should always remain common and uncultivated. He gave it to the use of the Industrious and Rational, (and *Labour* was to be his title to it;).<sup>53</sup>

Here Locke clearly anticipates the economists by speaking in terms of benefit maximizing.

Another natural rights perspective suggests that the jus-

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direct labor as he goes on to justify the accumulation of money and the use of money for exchange. Direct labor is property itself under his theory and it may be disposed in exchange for other property, including money. See PAUL, PROPERTY RIGHTS AND EMINENT DOMAIN, *supra* note 45, at 190.

<sup>50</sup> Locke, *supra* note 23, at 287-288. See PAUL, PROPERTY RIGHTS AND EMINENT DOMAIN, *supra* note 45, at 193-239 (addressing weaknesses in Locke's logic).

<sup>51</sup> LOCKE, *supra* note 23, at 291.

<sup>52</sup> Epstein, *Possession as the Root of Title*, *supra* note 19, at 1227.

<sup>53</sup> LOCKE, *supra* note 23, at 291.

tification for the right lies partly in the "survivalist objective or value."<sup>54</sup>

The survival of each individual<sup>55</sup> depends on his ability to carry out purposive action. If the end results of this purposive action are removed from the agent [of the creation of property value]'s control, and employed by others to satisfy their needs or desires, then the survival of . . . the agent is put in jeopardy. *But for the action of [the agent] no good . . . would exist to satisfy any human's needs or desires.* To deny [the agent's] ownership—meaning the right to exclude others from taking [the property] without [the agent's] consent—would be tantamount to granting to others, with [the same attributes as the agent], the right to live parasitically off [the agent's] efforts. *But no such right could ever be defensible.*<sup>56</sup>

In spite of his criticism of the Lockean justification of first possession, Professor Epstein determines that the allocation to the first possessor is defensible.<sup>57</sup> He asserts that some system of property rights is necessary and that two systems present themselves: first possession systems and systems creating "original common ownership in all the citizens of the jurisdiction."<sup>58</sup> The question then becomes "*not* how can any system of property rights be justified in the abstract, but *which* of these two systems has, when all is said and done, the better claim for allegiance."<sup>59</sup> The first factor to consider in the comparison is the type of state required by each system. The rules of first possession require a minimal state, while a system based on common ownership requires "more extensive

<sup>54</sup> PAUL, *PROPERTY RIGHTS AND EMINENT DOMAIN*, *supra* note 45, at 232.

<sup>55</sup> [And the survival of society in the aggregate?]

<sup>56</sup> PAUL, *PROPERTY RIGHTS AND EMINENT DOMAIN*, *supra* note 45, at 232 (emphasis added). This justification could be reduced to economic benefit terms as well. Paul asserts that this justification is less susceptible to use by 'maximizers' to deprive anyone of a property right merely because that right in other hands would increase social utility. There is much more to Paul's theory than may be presented here.

<sup>57</sup> Epstein, *Possession as the Root of Title*, *supra* note 19, at 1238.

<sup>58</sup> *Id.*

<sup>59</sup> *Id.*

public control.”<sup>60</sup> Second, if the system of common control is taken by the state, there is nothing that requires such a system to restrict itself to acquisition of external things. That is, “there is nothing in principle which says that the theory could not be extended as well to govern the way in which individuals acquire rights in themselves . . . [T]he theory of common ownership clearly seems to lend itself to totalitarian uses and abuses.”<sup>61</sup>

A fundamental objection to either system is that “neither is powerful enough to bind non-consenting individuals.”<sup>62</sup> This objection seems to deny civil society any organizing principle, even though such a principle is necessary for civilization to exist. Epstein handles this dilemma by asserting the *existence* of civilization and institutions. “[S]ome weight should be attached to the rules under which a society in the past has organized its property institutions.”<sup>63</sup> The “unique place of first possession” rests in its having “enjoyed in all past times the status of a legal rule.”<sup>64</sup>

Thus, those displacing such a system must bear the burden of justification. Epstein asserts that, on Earth, this is a very heavy burden since its repudiation would call into question all titles.<sup>65</sup> With respect to regions not yet claimed or exploited, such as outer space, Epstein suggests that the claim is less strong.<sup>66</sup> And to the extent that no old title or established expectation is called into question, this may be true.

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<sup>60</sup> *Id.* at 1339.

<sup>61</sup> *Id.* This argument may be related to Locke's theory of property rights. Locke's fundamental assumption in justifying a rule of allocation by first possession was the right to one's own body and the uses to which it may be put. See discussion *supra* note 47.

<sup>62</sup> Epstein, *Possession as the Root of the Title*, *supra* note 19, at 1240.

<sup>63</sup> *Id.* at 1241.

<sup>64</sup> *Id.*

<sup>65</sup> This is true even with respect to those states which do not recognize the principle of first possession or property internally. Externally, their claims to their lands and 'personal' property rest, or can be traced, to a first possession. “[T]he sway of the first possession rule in international affairs is, if anything, more pronounced than it is in private law contexts.” *Id.* at 1242 n.27.

<sup>66</sup> *Id.* at 1252.

#### 4. Conclusion

The practical problem of allocating those unclaimed properties will remain and will manifest itself in two ways. First, to the extent that it becomes desirable to utilize unclaimed property, some incentive and guarantee must be provided to stimulate that development. This problem is considered in part II. C and part III of this note. Second, the problem of allocating unclaimed properties will arise, as it has historically, in disputes between rival claimants to a property. The West has developed its institutions on the basis of the validity of first possession. The continuing viability of these institutions lies in their ability to resolve these disputes between claimants. The success of a system on Earth should at least raise a presumption of its utility in outer space.<sup>67</sup>

The point of the preceding discussion in this section was to illustrate the foundations of property rights and some considerations inherent in discussions of those rights, not to argue for the philosophical correctness of those rights. The sources cited, for the most part, are not authoritative in any legal sense. Law itself develops in response to real problems and thus has a historical basis. Arguably, the philosophical justifications presented are rationalizations of historical decisions. Their usefulness lie, then, in their ability to condense the considerations inherent in the legal decisions. Absent fundamental differences between the property under consideration, a system based on allocation by first possession, which was historically valid, will continue to be a valid solution to allocation in the future. And the philosophical justifications for the historical system will have validity in rationalizing future applications of the system.

#### B. ELEMENTS OF PROPERTY LAW REQUIRED FOR THE DEVELOPMENT OF SPACE RESOURCES

The opening section of this note suggested some of the

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<sup>67</sup> See *infra* notes 68-73 and accompanying text.

reasons for interest in the potential development of outer space resources. Not surprisingly, these interests may be reduced to the primary reasons for the development of any resource: the potential for benefit to the developers and the potential for benefit to society. It was also suggested that the commercialization of space, through the American system of free enterprise, was vital socially and economically to the United States.<sup>68</sup> On Earth, an allocation system is based on property rights, including the power to exclude—as granted to the first possessor,<sup>69</sup> the power to use, and the power to dispose. States enforce this system according to sovereign power or international agreement or custom. Which of these elements are needed in outer space?

Commentators often state that space offers the opportunity for a fresh start in the relations between states. Outer space is seen by some as an opportunity to test the concept of world government,<sup>70</sup> or as an opportunity to develop a new world order oriented toward people rather than states.<sup>71</sup> One author asserts that space may be regulated with the result of “avoiding seeds of conflict en-

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<sup>68</sup> See *supra* text accompanying note 14. Such development is vital to the West, generally, for economic and political reasons. See *supra* text accompanying notes 10-13. The property systems of the major Western industrialized states, and the most successful of the Oriental states as well, are compatible.

<sup>69</sup> Actual possession is required. Such possession requires actual use and does not include idle reservations of rights for future use. Thus, had the U.S. actually claimed the Moon for itself in 1969, the validity of such claim would be open to challenge as no actual use was made of the vast majority of the Moon. Furthermore, even any claim to the locations where landing and use may be said to have occurred could be challenged as abandoned.

<sup>70</sup> Allen D. Webber, Note, *Extraterrestrial Law on the Final Frontier: A Regime to Govern the Development of Celestial Body Resources*, 71 GEO. L.J. 1427, 1456 (1983).

<sup>71</sup> “‘Common heritage’ is a term which appeals to the world order activist, but only if it involves people in the shaping, as well as the sharing of values. [Common heritage of mankind] offers promise for a shift in power away from nation-states, upward to international institutions, and downward to nongovernmental organizations.” A. Blaser, Note, *The Common Heritage in Its Infinite Variety: Space Law and the Moon in the 1990s*, — GEO. J.L. & TECH. —, — (1991) (manuscript at 38-39, on file with author). This sort of utopian populism puts one in mind of Rousseau’s condemnation of democracy, “[w]ere there a people of gods, it would govern itself democratically. So perfect a government is not suited to men,” ROUSSEAU, *supra* note 23, at 56, and may be subject to a similar criticism.

countered through history on Earth."<sup>72</sup> In spite of these utopian sentiments, prospective developers of space will be of the same stock as those that effectively developed the resources of Earth.<sup>73</sup> It would seem to follow that these developers' security requirements would be the same in outer space as they are on Earth. "Any private industry which is considering activities in outer space will seek in those activities the same degree of security which it enjoys in its earthbound activities."<sup>74</sup>

Thus, it seems reasonable to presume<sup>75</sup> that space venturists will require the same rights and guarantees in outer space that they require on Earth. Furthermore, it seems reasonable to assume that those systems that are efficient and equitable on Earth will also be efficient and equitable in outer space.<sup>76</sup> Man's operating environment changes as he leaves the atmosphere of Earth behind; his needs and shortcomings remain unchanged. The burden should be on those who would propose alternative sys-

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<sup>72</sup> Martin Menter, *Commercial Space Activities Under the Moon Treaty*, 7 *SYRACUSE J. INT'L L. & COM.* 213, 237 (1979-80). However, reality is recognized by some authors. "History teaches us that whenever disputes arise over large quantities of resources or large tracts of land, conflict is virtually inevitable." Barritt, *supra* note 10, at 616 (citing as examples range wars in the settlement of the American West and the California gold rush).

<sup>73</sup> A German jurist writes: "[T]he generalized formulas of the Space Treaty show a clear tendency to conceal reality in that they speak of a harmonious world, while leaving the numerous conflicts of interest largely unsolved . . ." Adrian Bueckling, *The Strategy of Semantics and the "Mankind Provisions" of the Space Treaty*, 7 *J. SPACE L.* 15, 18 (1979).

<sup>74</sup> Roger K. Hoover, *Law and Security in Outer Space from the Viewpoint of Private Industry*, 11 *J. SPACE L.* 115, 116 (1983). "For commercial ventures to expend the capital, time, and risk necessary for the successful commercialization of space, there must be a stable and predictable environment for investment." Kosmo, *supra* note 4, at 1065.

<sup>75</sup> See *supra* note tex following 60.

<sup>76</sup> Market allocation of property rights in space has been argued to be more efficient than non-market mechanism. Clas G. Wihlborg and Per Wijkman, *Outer Space Resources in Efficient and Equitable Use: New Frontiers for Old Principles*, 24 *J. L. & ECON.* 23, 28-37 (1981). To achieve efficiency, "markets for space resources should have the following properties: (A) complete allocation regime, (B) divisible and marketable user rights, (C) long contract periods, (D) well defined liability rules." *Id.* at 29. Although using the language of contract rather than the common law language of estates, this prescription is closely analogous to the requirements for an efficient system of property on Earth.

tems to prove the superiority of such a system over any historically successful system. Without accepting the burden of proving the necessity of historic rights and guarantees, the following discussion is offered to suggest the similarity of needs on Earth and in outer space.

The discussion of the power to exclude in the previous section suggested the necessity of granting that power to the developer thus ensuring the fruits of his investment and the efficiency of his use. Private industrialists have argued the need for the power to exclude,<sup>77</sup> and governmental venturers surely want the same power. The power to use is essential to development and would be a necessary element of space property.<sup>78</sup> A method of creating the property right initially, or obtaining title, is needed as well. Though it is conceivable that a system of allocation that limits the power to dispose might be workable,<sup>79</sup> on Earth, the power of disposition is believed to enhance the value of property rights, creating an incentive to invest and increasing the efficiency of the system.<sup>80</sup> Finally, there must exist a mechanism of guaranteeing and enforcing those rights to give them value. This is no less true in space than on Earth.

## II. SPACE LAW AND PROPERTY

This part examines the current status of space law and property. The first section examines treaties and customary law in space relating to property. The second section presents a discussion of the developing 'law' relating to the allocation of geostationary orbit positions. Included in that section is a discussion of the geostationary orbit,

<sup>77</sup> "Private industry would want to be assured that, once having established its operations in some outer space location, it could conduct those operations without interference from others." Hoover, *supra* note 74, at 120. *See also* Kosmo, *supra* note 4, at 1084 (resources reduced to possession and processed should belong to the entrepreneur who took the risks).

<sup>78</sup> "An acceptable system must stipulate the right of continued use in space resources." Kosmo, *supra* note 4, at 1084. *See also supra* text accompanying notes 28-31.

<sup>79</sup> *See discussion infra* Parts II B-C.

<sup>80</sup> *See supra* note 32 accompanying text.

its importance, and the institutions and processes regulating its use. The final section concludes with an evaluation of the adequacy of the existing space law, including the law on allocation of geostationary orbit, for the efficient and equitable development of space resources.

#### *A. Current Status of Space Property Law*

##### *1. Treaties Governing Property Rights in Space*

The principal treaties dealing with the utilization of outer space resources are the Outer Space Treaty<sup>81</sup> and the Moon Treaty.<sup>82</sup> Both are multilateral treaties that originated in the United Nations Committee on the Peaceful Uses of Outer Space.<sup>83</sup> The Outer Space Treaty was ratified by the United States Senate, in 1967, while the Moon Treaty was not. The Outer Space Treaty was ratified by ninety-eight states; the Moon Treaty was ratified by only seven states.<sup>84</sup>

###### *a. Outer Space Treaty of 1967*

The preamble to the Outer Space Treaty recognizes the "exploration and use" of outer space.<sup>85</sup> With regard to "exploration and use," however, the states who signed the treaty recognize, believe, and desire that such activity be carried out for the benefit of all mankind and for peaceful purposes.<sup>86</sup> Clearly the states who are parties to the treaty anticipated the exploration and use of outer space and have approved of such activity. The activity is not in any way limited by the preamble, which can best be

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<sup>81</sup> See *supra* note 1.

<sup>82</sup> See *supra* note 5.

<sup>83</sup> Michel Bourély, *The Contributions Made by International Organizations to the Formation of Space Law*, 10 J. SPACE L. 139, 145-47 (1982).

<sup>84</sup> U.S. DEPT. OF STATE, PUB. NO. 9433 A LIST OF TREATIES AND OTHER INTERNATIONAL AGREEMENTS OF THE UNITED STATES IN FORCE ON JANUARY 1, 1990, (1990) (Outer Space Treaty in force); *Multilateral Treaties Deposited with the Secretary General—Status as at 31 December 1989* at 327, U.N. Doc., ST/LEG/SER.E/8, U.N. Sales No. E.90.v.6 (1990) (lists states that ratified Moon Treaty).

<sup>85</sup> Outer Space Treaty, *supra* note 1, at 2411.

<sup>86</sup> *Id.*

seen as an expression of hope that such activities will be useful to mankind and will not become a source of conflict or danger to the Earth. The preamble generally provides a context for the authoritative articles of the treaty and is not itself meant to be binding, nor is it expressed in binding language.<sup>87</sup>

Article I purports to govern the exploration and use of outer space. The first section states that exploration and use "shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."<sup>88</sup> The first paragraph of Article I recognizes that space will be used and approves of that use subject to vaguely expressed qualifications.<sup>89</sup>

The major space powers believe that their activities in space are not limited by any obligation set forth in Article I. When the treaty was ratified in the United States Senate it was "the understanding of the Committee on Foreign Relations that nothing in Article I, paragraph 1, [of the Treaty] diminishes or alters the right of the United States to determine how . . . it shares the benefits and results of its space activities."<sup>90</sup> A leading authority asserts the posi-

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<sup>87</sup> "The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, . . . its preamble and annexes . . ." Vienna Convention on the Law of Treaties, art. 31(2), § 3, U.N. Doc. A/Conf. 39/27 (—); 63 AM. J. INT. L. 875, 885 (1969) (not ratified by the U.S.; adopted by the UN in 1969, entered into force in 1981).

<sup>88</sup> Outer Space Treaty, *supra* note 1, art I.

<sup>89</sup> Commentator Buekling noted that "mankind" lacks meaning in international law. He believed that the use of the word, without any legal meaning, was meant to both express hopes for a "state of affairs . . . yet to be attained" and to conceal the large measure of conflict of interest unresolved by the treaty between the state parties. Buekling, *supra* note 72, at 20. "Underneath the 'mankind' syndrome the relevant clauses of the Space Treaty offer little guidance as to what States may derive from them. Neither can it be satisfactorily established what rights a State not involved in space exploration might have in the achievements of the space powers." *Id.*

<sup>90</sup> *Treaty on Outer Space: Hearings Before the Senate Committee on Foreign Relations*, 90th Cong., 1st Sess. 1, 74 (1967). One observer interpreted this as an admission of at least some obligation to share on the part of the U.S. Siegfried Wiessner, *The Public Order of the Geostationary Orbit: Blueprints for the Future*, 9 YALE J. WORLD PUB. ORD. 217, 252 (1983).

tion of the United States that is Article I "a statement of general goals" and that the ratification of specialized treaties is necessary to create any specific obligations.<sup>91</sup> The U.S.S.R was of the opinion that the 'mankind provisions' of the Treaty, including Article 1, paragraph 1, have no "precise significance"<sup>92</sup> and that "the character and degree of participation of States in international space projects [such as the sharing of benefits] depend, ultimately on their will" which must be expressed in specific treaties.<sup>93</sup> No claims have ever been asserted against a space power under this provision, further evidencing that a belief exists among non-space powers that Article I creates no specific obligation on the space powers.<sup>94</sup> With these factors in mind, Jasentuliyana<sup>95</sup> concluded that the obligations of Article I paragraph 1 "constitute more a moral and philosophical obligation than a legal requirement."<sup>96</sup>

Paragraph 2 of Article I establishes the right of access to outer space.<sup>97</sup> This paragraph, however, cannot be reasonably understood as creating positive obligations on the space powers to enable such access. An interesting fea-

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<sup>91</sup> Nandasari Jasentuliyana, *Article I of the Outer Space Treaty Revisited*, 17 J. SPACE L. 129, 139 (1989) (citing Senate Committee and the State Department sources). At the time "[t]he belief that agreement must be reached as soon as possible affected the matter of whether the agreement should be limited to a statement of general principles or whether it should establish more specific regulation of space activity." Paul G. Dembling and Daniel M. Arons, *The Evolution of the Outer Space Treaty*, 33 J. AIR L. & COM. 419, 428 (1967) (Dembling was General Counsel to NASA at the time of the treaty negotiations). The former course was apparently taken. "The Preamble and Articles I, II and III of the Treaty state broad principles which, from the outset of discussion, were generally acceptable to the members of the Subcommittee and provoked little disagreement as to wording." *Id.* at 429.

<sup>92</sup> Buekling, *supra* note 72, at 19.

<sup>93</sup> Jasentuliyana, *supra* note 91, at 140 (quoting Soviet delegate to COPUOS).

<sup>94</sup> *Id.*

<sup>95</sup> Jasentuliyana is Director of Outer Space Affairs Division of the United Nations.

<sup>96</sup> Jasentuliyana, *supra* note 91, at 130; see also David Goldman, *Settlement and Sovereignty on Outer Space*, 22 U. W. ONT. L. REV. 155, 157-158 (1984).

<sup>97</sup> Outer Space Treaty, *supra* note 1, art. 1, ¶ 2. "Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all states without discrimination" *Id.*

ture of this paragraph is its provision that access will be granted "in accordance with international law."<sup>98</sup> Based partly on this provision, as well as other considerations, it is generally agreed that international law is applicable to supplement and clarify the Outer Space Treaty, which may be thought of as containing only the leading, albeit vague, principles.<sup>99</sup>

Article II prohibits national appropriation of outer space.<sup>100</sup> The mandate of this provision is seemingly clear.<sup>101</sup> When strictly interpreted, however, individual appropriation may not be prohibited,<sup>102</sup> even though the existence of any mechanism to secure the appropriation is in question. While, "[t]he establishment of a permanent settlement or the carrying out of commercial activities by nationals of a country on a celestial body may constitute national appropriation if the activities take place under the supreme authority (sovereignty) of the state[,]"<sup>103</sup> given the obligation of each state to oversee the activities of its nationals in outer space under Article VI and the liability of the state for actions of its nationals under Article VII of the Outer Space Treaty and the Liability Convention,<sup>104</sup> it is extremely unlikely that any state would

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<sup>98</sup> *Id.*

<sup>99</sup> Cestmir Cepelka & Jamie H. Gilmour, *The Application of General International Law in Outer Space*, 36 J. AIR L. & COM. 30, 30 (1970). "[G]eneral international law, which governs the conduct of states in their mutual relations, is not confined to the ill-defined upper limit of national airspace, but is applicable to activities of states in the vast realm of outer space. Thus the Space Treaty incorporates rule of general international law, apart from norms of *legis specialis* derogating therefrom." *Id.* Article III also incorporates international law into outer space. See Dembling, *supra* note 82, at 431-32.

<sup>100</sup> Outer Space Treaty, *supra* note 1, art. II. "Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means." *Id.*

<sup>101</sup> For a strict view of Article II, see Stephen Gorove, *Interpreting Article II of the Outer Space Treaty*, 37 FORDHAM L. REVIEW 349 (1969).

<sup>102</sup> *Id.* at 351.

<sup>103</sup> *Id.* at 352.

<sup>104</sup> Convention on International Liability for Damage Caused by Space Objects, opened for signature Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 (entered into force on Sept. 1, 1972) [hereinafter the Liability Convention]. United States oversight is reflected in the licensing requirements for commercial space launches embodied in the Commercial Space Launch Act, Pub. L. No. 98-575, § 6, 98 Stat.

allow activity by its nationals without some regulation and sanction.<sup>105</sup> Thus, the ban on appropriation is, to some extent, inconsistent with the requirements of other multi-lateral treaties.

When read in conjunction with other articles of the treaty, the meaning of the Article II prohibition becomes even less certain. National appropriation by any of the listed means is clearly prohibited;<sup>106</sup> but it may be argued that property rights may be obtained and a form of quasi-sovereignty may exist under the Outer Space Treaty. "The general principle of non-appropriation is, in effect, circumscribed to an extent by treaty provisions designed to facilitate the exploration and use of outer space."<sup>107</sup> Summarizing the argument, Article I specifically provides for use of outer space. "In its legal sense, 'use' usually refers to the enjoyment of property . . . ."<sup>108</sup> Therefore, in order to facilitate the use contemplated in Article I, some form of appropriation must be permissible. Article IV prohibits the establishment of facilities on celestial bodies for military purposes. By implication, facilities for

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3055 (1984). Section 2 states that the United States will, "to the extent necessary, regulate such launches and services in order to ensure compliance with international obligations of the United States . . . ." *Id.*

The United States is currently appraising its oversight through the National Space Council. "It is the sense of Congress that the National Space Council should, by October 1, 1991, establish guidelines and policy recommendations, including the need for licensing, for the conduct of expendable launch vehicle operations in which a Federal agency assumes substantial responsibility for public safety, indemnification, and administrative oversight." NASA Authorization Act, *supra* note 2, § 108(b).

<sup>105</sup> Cepelka & Gilmour, *supra* note 99, at 38, reached the same conclusion, without reference to outer space liability laws, based on the erroneous deduction that Art. II implied that territorial jurisdiction may not exist. The better view is that Art VIII permits at least a form of territorial jurisdiction. *See infra* note 109 and accompanying text.

<sup>106</sup> *See* Cepelka and Gilmour, *supra* note 99, at 32 (discussion of forms of appropriation including 'occupation' and 'means of use').

<sup>107</sup> Goldman, *supra* note 96, at 158.

<sup>108</sup> *Id.* The passage continues, "often with an advantage or profit arising therefrom, by the occupancy, utilization or exercise of the property." *Id.* In the debates on the Outer Space Treaty, "[a]lthough there was some difference of opinion over the meaning of the word 'use,' as distinguished from 'exploration,' it appeared that most of the delegations agreed with the French delegate that 'use' means 'exploitation.'" Dembling & Arons, *supra* note 91, at 431.

peaceful uses of space are permissible. Article VIII provides for the retention of ownership of objects launched into space and jurisdiction over the objects, and personnel, so launched by the state of registry.<sup>109</sup> If these objects and personnel settle on a celestial body, the exercise of jurisdiction "amounts to the exercise of sovereign powers in an area of outer space."<sup>110</sup> Article VI, which provides for national responsibility for objects launched into space, supports this conclusion.<sup>111</sup>

The power to exclude may also be inferred from the Outer Space Treaty.<sup>112</sup> Article IX contains an injunction to consult with other states before conducting activities that "would cause potentially harmful interference with activities of other State Parties in the peaceful exploration *and use* of outer space, including the moon and other celestial bodies. . ."<sup>113</sup> This clause is interpreted as requiring consultation when the consequence of activity to another party is uncertain.<sup>114</sup> Activities that will harmfully interfere are prohibited, without the need for consultation, as an implicit consequence of the creation of meaningful user rights alluded to in Article IX.<sup>115</sup>

The interpretation of the Outer Space Treaty that allows property holding in space and quasi-sovereignty must, by inference, allow for some form of reasonable first use method of allocation.<sup>116</sup> Since the Outer Space Treaty envisions use of space, but does not establish any regulatory regime to oversee allocations of outer space, first use is the only possible form of allocation. This could take the form of occupation and reasonable use.<sup>117</sup>

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<sup>109</sup> Outer Space Treaty, *supra* note 1, art. VIII.

<sup>110</sup> Goldman, *supra* note 96, at 159.

<sup>111</sup> Outer Space Treaty, *supra* note 1, art. VI.

<sup>112</sup> Goldman, *supra* note 96, at 160-61.

<sup>113</sup> Outer Space Treaty, *supra* note 1, art. IX (emphasis added).

<sup>114</sup> Goldman, *supra* note 96, at 161.

<sup>115</sup> *Id.* at 160-61.

<sup>116</sup> Barritt, *supra* note 10, at 636.

<sup>117</sup> A reasonable use doctrine governs water use law. "[T]he 'reasonable use' doctrine, grants a riparian owner the right to be free from unreasonable uses of the watercourse by other riparian owners. The goal of this approach is to make

But, it is still difficult to distinguish this private appropriation with national sanction under national jurisdiction from a form of national appropriation at some level.<sup>118</sup> The Outer Space Treaty may simply be vague, and hence merely precatory, on the issues of use and appropriation. The consequence of this could be to make the treaty non-binding as creating no specific rule on these issues by analogy to the treatment of Article I.

The Outer Space Treaty also allows for withdrawal, in which case the treaty would not be binding to the withdrawing state.<sup>119</sup> It is argued, however, that the treaty has become a statement of customary law.<sup>120</sup> This conclusion is based partly on the acquiescence of states to the principles embodied in the treaty before and after its ratification.<sup>121</sup> If these principles are indeed customary law, then the withdrawing state may be bound by them despite its withdrawal.<sup>122</sup> Two points must be remembered though. First, any law based on customary principles will be at least as vague and contradictory as the treaty embodying those principles. Second, irrespective of obligations under customary law, the treaty itself will not be binding as it specifically allows for withdrawal.

### b. The Moon Treaty

The Moon Treaty introduces the concept of the common heritage of mankind to considerations of space prop-

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full and beneficial use of a watercourse. Water may be put to any use, so long as reasonable uses by other riparian owners are not adversely affected." Barritt, *supra* note 10, at 637-38 (citing *RESTATEMENT (SECOND) OF TORTS*, ch. 41, *Interference With the Use of Water ("Riparian Rights")*). Such a form of allocation seems completely compatible with Article IX of the Outer Space Treaty.

<sup>118</sup> See *supra* note 91 and accompanying text.

<sup>119</sup> Outer Space Treaty, *supra* note 1, art. XVI.

<sup>120</sup> Wiessner, *supra* note 90, at 246.

<sup>121</sup> Goldman, *supra* note 96, at 168; Cepelka & Gilmour, *supra* note 99, at 46 ("state that are Parties to the Space Treaty which exercise their right to withdraw . . . will be bound . . . by some general international law rules of a *jus cogens* character, while, on the other hand, they will retain full right to derogate from other rules of general international law which are in principle, *juris dispositivi*.").

<sup>122</sup> The topic of customary law in space will be considered more completely *infra* notes 128-135 and accompanying text.

erty law. The obligations incurred by states under this principle, and the Moon Treaty itself, are unclear and have been the subject of much commentary.<sup>123</sup> The Moon Treaty outlaws property rights in any celestial body absent the establishment of an international regime.<sup>124</sup> The Moon Treaty also aims at closing the avenue toward property and quasi-sovereignty left by the Outer Space Treaty.<sup>125</sup> The Moon Treaty, however, has yet not been ratified by any major space power and has been signed by very few states.<sup>126</sup> It is not binding as a treaty on the non-party states and the claim that it represents customary law is probably not credible.<sup>127</sup>

### c. Customary Law

The Outer Space Treaty supports the proposition that international law is applicable in outer space.<sup>128</sup> This is a logical conclusion since international law is meant to regulate the relations between states wherever such states may come into contact outside of some national jurisdiction. Custom is an established source of international

<sup>123</sup> E.g., Moon Treaty Report, *supra* note 5; Christopher C. Joyner, *Legal Implications of the Concept of the Common Heritage of Mankind*, 35 INT'L & COMP. L.Q. 190 (1986); Mary V. White, Note, *The Common Heritage of Mankind: An Assessment*, 14 CASE W. RES. J. INT'L L. 509 (1982); Kosmo, *supra* note 4, at 1078; Richard D. Cunningham, *Space Commerce and Secured Financing New Frontiers for the U.C.C.*, 40 BUS. LAW. 803, 807 (1985); Menter, *Commercial Space Activities Under the Moon Treaty*, *supra* note 71; Barritt, *supra* note 10, at 628; Raclin, *supra* note 4, at 787.

<sup>124</sup> Moon Treaty, *supra* note 5, art. 11, para. 3.

<sup>125</sup> *Id.* "The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the moon, including structures connected with its surface or the subsurface, shall not create a right of ownership over the surface or the subsurface of the moon or any areas thereof." *Id.* Article 12 continues to allow jurisdiction and ownership of material launched into space, which supports, interpreting, the Outer Space Treaty as allowing some appropriation. *See supra* notes 97-103 and accompanying text.

<sup>126</sup> Australia, a state with some space activity, has ratified the treaty. *See supra* note 83.

<sup>127</sup> Vladlen Vereshchetin & Gennaly M. Danilenko, *Custom as a Source of International Law of Outer Space*, 13 J. SPACE L. 22, 33-34 (1985) ("[i]t seems . . . hardly possible to accept such a contention" that the Moon Treaty represents custom).

<sup>128</sup> *See supra* text accompanying notes 97-98.

law<sup>129</sup> and will then, in general, apply in outer space. "Custom in international law is a practice followed by those concerned because they feel legally obliged to behave in such a way."<sup>130</sup>

While it may be accepted that custom extends to outer space, the content of the customary law is open to question. Some argue that the Outer Space Treaty may represent principles of customary law in outer space,<sup>131</sup> but this assertion must be reconciled with the lack of practice in general with respect to exploitation of the resources of outer space and property rights in particular. The experience so far is limited to the use of geostationary orbit positions<sup>132</sup> and non-permanent moon visits where limited amounts of lunar material were removed and no claims of national appropriation were made. "The fact that practice has been engaged in only for a brief period of time will not in itself be a bar to the formation of a customary rule . . ."<sup>133</sup> Within the specified period of time, however, "[s]tate practice . . . should have been both extensive and virtually uniform."<sup>134</sup>

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<sup>129</sup> Statute of the International Court of Justice, annexed to the Charter of the United Nations, art. 38, part B, 59 Stat. 1055, T.S. No. 933 (1945).

<sup>130</sup> REBECCA M. WALLACE, *INTERNATIONAL LAW* 9 (1986).

<sup>131</sup> See *supra* note 108 and accompanying text. Some parts of a treaty may represent customary law while other parts may not. For example, the general principles of art. I and art. 2 of the Outer Space Treaty "which have been carried forward" from prior statements of law and practice may be custom while the obligations of other provisions, such as the right to access in art. XII, may not be custom. Goldman, *supra* note 96, at 167.

<sup>132</sup> See discussion *infra* part I.B. So far as practice is concerned there, the rule of allocation has been first-come, first-served. See Michael S. Straubel, *Telecommunication Satellites and Market Forces: How Should the Geostationary Orbit Be Regulated by the F.C.C.*, 17 N.C. J. INT'L L. & COM. REG. 205, 209 (1992). To date, states have respected those allocations.

<sup>133</sup> Wallace, *supra* note 130, at 9. "[I]nternational law does not require the existence of practice from 'times immemorial' for the creation of customary rules." Vereshchetin & Danilenko, *supra* note 127, at 25.

<sup>134</sup> *North Sea Continental Shelf Cases*, 1969 I.C.J. 3, 43.

Customary international law can not come into being 'instantly' because custom is based on constant and uniform practice. The consolidation and recognition of general, constant and uniform state practice require the existence of a number of precedents. It is obvious, that custom calls for the passage of at least a certain period of time."

Thus, the limited number of research oriented visits to the Moon do not make a strong case for any custom with respect to resource exploitation. "In any event, one thing that can be said with certainty is that custom, as a source of international law, cannot create legal obligations concerning the future exploitation of the natural resources of the Moon before such exploitation becomes feasible and the relations of the state with respect to this problem acquire the necessary level of consistency and uniformity."<sup>135</sup> Since the principles of the Outer Space Treaty antedate any practice in resource exploitation on celestial bodies, it cannot yet represent custom.<sup>136</sup> To the extent that any custom exists, it must be found in some actual practice. The developing law of geostationary orbit allocation may be such a source, though the analogy between the use of a position in space as a resource and the use of the resources of a celestial body may not be sufficiently close to create a precedent in law. The allocation of geostationary orbits and its adequacy as a model for the development of a law of property rights in celestial bodies is the subject of the next sections of this Note.

## B. DEVELOPING 'PROPERTY LAW' IN GEOSTATIONARY ORBIT

This Section examines the developing law of property in outer space relating to the allocation of geostationary orbit positions. Included in this Section is a discussion of the geostationary orbit, its importance and the institutions and processes regulating its use. While the rele-

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Vereshchetin & Danilenko, *supra* note 127, at 25 n.6.

<sup>135</sup> Vereshchetin & Danilenko, *supra* note 127, at 34.

<sup>136</sup> Cf. Goldman, *supra* note 96, at 168. David Goldman agrees that there is to date very little state practice which may constitute unequivocal evidence of states abiding by the principles of the Outer Space Treaty. *Id.* But, there is evidence that shows the space powers have refrained from asserting sovereign claims or from denying freedom of use. *Id.* He concludes, at least with respect to these elements, that custom should be taken as established to avoid "friction because of long-standing expectations." *Id.* One might argue, however, that there are no realistic expectations with respect to utilization among the non-space powers because there has been no practice aimed at giving these states space capabilities.

vance of this body of law to the allocation of rights in celestial bodies is uncertain, the geostationary orbit is the only current area of practice in the utilization of a space resource. Since only practice can generate custom, and accepted practice serves to illuminate the meaning of vague treaty terms, geostationary orbit practices are significant in the development of space property law. The allocation of voids, however, whose only significance is their location relative to points on the Earth, may not be adequately analogous to the allocation of celestial bodies. Indeed, in terms existing law, the voids may be likened to the seas and celestial bodies to the land. On Earth, completely different legal regimes exist for the seas and the lands and it would not be illogical to carry that practice into outer space.

### *1. The Geostationary Orbit and Its Importance*

Geostationary orbit is a circular orbit in the plane of the Earth's equator approximately 22,300 miles above the Earth's surface.<sup>137</sup> At that altitude, a satellite in the geostationary orbit rotates about the Earth's axis at a rate of once per day, the same as the corresponding point on the Earth's surface.<sup>138</sup> To an observer standing at a point on the Earth's surface, the satellite will appear to be fixed in space.<sup>139</sup> The significance of this phenomenon lies in the simplicity of the antenna-tracking equipment required for communication with a geostationary satellite and the ability of a single satellite to maintain constant coverage of a locus of points on the Earth's surface. The combination

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<sup>137</sup> OFFICE OF TECHNOLOGY ASSESSMENT, RADIOFREQUENCY USE AND MANAGEMENT IMPACTS FROM THE WORLD ADMINISTRATIVE RADIO CONFERENCE OF 1979 73 (1982) [hereinafter OTA WARC Report].

<sup>138</sup> *Id.*

<sup>139</sup> The satellite is, of course, moving through space and does not remain physically fixed in any spot relative to other celestial bodies. At any other altitude, the satellite velocity required to match the rotation of the Earth results in an unstable orbit. A complete discussion of the geostationary and related orbits may be found in *Background Paper for the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Efficient Use of the Geostationary Orbit*, at 5-9 U.N. Doc. A/CONF. 101/BP/7 (1981) [hereinafter *Unispace Report*].

of these two factors makes satellites in geostationary orbit ideal for communications purposes.<sup>140</sup>

The number of satellites that may effectively use the geostationary orbit is limited by two factors. The first limiting factor is the potential for interference, which includes physical interference, through collisions, and radio interference. Physical interference is not generally thought to be significantly limiting. "With consideration only for avoidance of physical collisions between satellites, the number of satellites that can be placed in the geostationary orbit is nearly unlimited."<sup>141</sup> Radio interference is potentially much more significant; however, advancing technology and careful coordination will tend to reduce the impact of the interference limitation.

At the end of 1984 a total of 138 satellites of all types were operating in geostationary orbit, including eighty communications satellites.<sup>142</sup> The minimum spacing re-

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<sup>140</sup> *Id.* at 9-12. Both interactive communications and broadcasting. There are many other uses for geostationary orbit as well, but these uses do not create nearly as much demand for allocations of orbit positions. *Id.*

<sup>141</sup> OTA WARC Report, *supra* note 137, at 73. Active satellites which are able to maintain station are not likely to collide. "Since most satellites are able to maintain their position within [plus or minus] 0.1 degree of longitude, there are 1800 'slots' each 0.2 degree wide, in the geostationary orbit such that there would be no risk of collision between functioning satellites." *Unispace Report*, *supra* note 139, at 21. WARC 79 reduced the station keeping tolerance for fixed satellite service to plus or minus 0.1 degree. *Id.* Ten operative satellites could occupy each slot and there would still be fewer than 1 collision per 400,000 years. *Id.* at 12. If 110 active and 310 inactive satellites occupied the geostationary orbit, each with an average cross-sectional area of 168 m<sup>2</sup>, the probability of a collision would be  $9.7 \times 10^{-4}$ . *Id.* at 13.

The danger of collision with inactive satellites may be easily resolved if these satellites are removed from geostationary orbit by boosting the satellite to a new orbit at the end of its useful life. *Id.* at 13-14. "[I]nactive satellites should be boosted into a circular orbit at least 300 km farther out." OFFICE OF TECH. ASSESSMENT, ORBITING DEBRIS: A SPACE ENVIRONMENTAL PROBLEM 26 (1990) (citing V.A. Chobotov, *Disposal of Spacecraft at End-of-Life in Geosynchronous Orbit*, AAS/AIAA Astrodynamics Specialist Conference (1989)). However, "[i]f a satellite in an orbit less than 160 km beyond [geostationary orbit] were to break up, roughly half of its fragments would eventually drift back through [geostationary orbit], posing a greater hazard to active satellites along the orbital band than if the satellite had remained in [geostationary orbit]." *Id.* See also Wiessner, *supra* note 90, at 225-28 (pessimistic discussion of inactive satellites and space junk hazards).

<sup>142</sup> Steven E. Doyle, *Regulating the Geostationary Orbit: ITU's WARC-ORB - '85-'88*,

quired in 1981 to avoid radio interference was between three and five degrees.<sup>143</sup> By utilizing advances in antenna design that were foreseeable in 1981, the minimum required space between satellites could be reduced by half. This would result in 144 to 240 nominal slots. There are currently three frequency bands used for communications,<sup>144</sup> which means that between 432 and 720 communications systems could operate in the orbit. This number could easily be increased by use of technology that has been available and in limited use since 1981. First, beam polarization could double the number systems operating in the orbit since adjacent satellites using the same frequency band could use radiation with different polarizations. This would increase the capacity of the orbits from 720 to 1,200 slots.<sup>145</sup> Furthermore, systems aimed at geographically separated points on the Earth will not interfere. Conservatively, the capacity of the orbit is doubled by having adjacent systems serve points alternatively in the northern and southern hemisphere.<sup>146</sup> This results in 1,440 to 2,400 slots.<sup>147</sup> The use of uplink/downlink reversal could increase the number of satellites by 70 to 90 percent, resulting in 2,450 to 4,560 slots!<sup>148</sup>

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15 J. SPACE L. 1, 8-9 (1987) (citing ITU WARC-ORB 85 Second Advisory Committee Report (1985), submitted in F.C.C. Doc. Gen. 80-741 (Jan. 31, 1985)).

<sup>143</sup> *Unispace Report*, *supra* note 139, at 17.

<sup>144</sup> *Id.* at 20.

<sup>145</sup> This number is calculated by doubling the capacity of the lower two frequency bands and leaving the upper band alone since, at the higher frequencies, there are technical problems with depolarization due to precipitation. *Unispace Report*, *supra* note 139, at 20.

<sup>146</sup> *Id.* The service areas probably do not need to be separated so greatly. "Sharing the geostationary orbit in a particular frequency band is principally a problem of sharing between adjacent countries." OTA WARC Report, *supra* note 137, at 73. Some would argue that there is no demand for service in the southern hemisphere so these gains are illusory. *Id.* at 73-74. However, these gains should serve to comfort the developing nations of the world, the majority of which are located in the southern hemisphere, since the use of the orbit by northern states does not preempt the use by southern states. *Id.*

<sup>147</sup> See Michael J. Finch, Note, *Limited Space: Allocating the Geostationary Orbit*, 7 Nw. J. INT'L L. & Bus. 788, 789 (1986) (citing Paris Arnopolous, *The International Politics of the Orbit Spectrum Issue*, 7 ANNALS AIR & SPACE L. 215, 216 (1982) (theoretical capacity is about 2,000 satellites)).

<sup>148</sup> *Unispace Report*, *supra* note 139, at 20. Information is sent to satellites via

By these simple calculations, there is room for at least twenty times as many satellites in geostationary orbit as currently reside there.<sup>149</sup>

The second limiting factor is geometrical.<sup>150</sup> The satellite serving a point on the Earth must be visible from that point on the Earth. Furthermore, because of atmospheric attenuation of signals, prudent practice indicates that the satellite must be at least ten degrees above the horizon at the service point.<sup>151</sup> One interesting consequence of this limitation is that the larger the area to be served, the more limited the possible positions for the satellite.<sup>152</sup> There is, however, flexibility in the placement of satellites serving smaller countries, such as many of the developing countries.

## 2. *The ITU and the Space WARC*

The geostationary orbit clearly may be considered a limited natural resource.<sup>153</sup> It is, however, a resource whose limits may be expanded through advances in technology. Nevertheless, coordination and regulation is appropriate to protect valuable investments in that orbit. The most important organization serving these needs is the International Telecommunications Union (ITU) acting through the World Administrative Radio Conference (WARC).<sup>154</sup>

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uplinks and that information is broadcast back to Earth via downlinks. In 1981, all uplinks used the same frequency bands and all downlinks used the same frequency bands. *Id.* If two satellites in nearby positions used uplink and downlink frequencies in the reverse sense, the potential for interference would decrease. The difficulties associated with administration, however, would increase. *Id.*

<sup>149</sup> This is admittedly a simplistic analysis that does not take into account many coordination problems, but it does illustrate the number of satellites that may use the orbit and the potential effects of technological advances on that capacity. See Wiessner, *supra* note 90, at 232 (technology considerations taken into account in the ITU Regional Plan for the Americas).

<sup>150</sup> OTA WARC Report, *supra* note 137, at 73.

<sup>151</sup> *Unispace Report*, *supra* note 139, at 5.

<sup>152</sup> *Id.* at 6.

<sup>153</sup> *Id.* at 4; Doyle, *supra* note 142, at 3; Bourely, *supra* note 83, at 149.

<sup>154</sup> The UN's COPOUS claims authority for the general coordination of space activities. *E.g.*, *Unispace Report*, *supra* note 139, at 4. So far, however, the CO-

The ITU is the oldest specialized agency of the United Nations. It was originally established as the International Telegraph Union in 1865. Since that time, the ITU has had a continuous role in the regulation and coordination of international communications.<sup>155</sup> Further, ITU was the first U.N. agency to produce regulations covering the use of outer space.<sup>156</sup> These regulations emerge from the works of WARC. The WARC's primary function is to allocate to states frequencies for radio communications.<sup>157</sup> Because of the intimate relationship between frequencies and orbit position in the geostationary orbit, the task of coordinating allocation of those positions has fallen on the ITU.<sup>158</sup>

### *3. Regulating the Use of the Geostationary Orbit*

The Outer Space Treaty provides little guidance for the allocation of geostationary orbit positions. The applicable articles include Article I, which calls for free access by all states, and Article II, which prohibits national appropriation.<sup>159</sup> The initial ITU regulations and the initial use of geostationary orbit predate the Treaty,<sup>160</sup> and the ratification of the Treaty did not have any immediate or specific impact on the ITU conventions. The users of geostationary orbit favor the non-appropriation clause<sup>161</sup> with respect to geostationary orbit and support the idea of

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POUS has been hampered by political squabbles and the ITU has effectively led the development of the geostationary orbit.

<sup>155</sup> Doyle, *supra* note 142, at 2.

<sup>156</sup> Bourely, *supra* note 83, at 148, 148 n.38 (earliest regulation of space dates from 1965).

<sup>157</sup> *Id.* at 148; Doyle, *supra* note 142, at 10.

<sup>158</sup> Doyle, *supra* note 142, at 5.

<sup>159</sup> Outer Space Treaty, *supra* note 1, 18 U.S.T. at 2412-13.

<sup>160</sup> Experimental use began in 1962; the first commercial user, Early Bird, was launched in April, 1965. Doyle, *supra* note 142, at 5.

<sup>161</sup> Thus, a proposed revision of the ITU Convention is criticized by an advisor to the F.C.C. because "its effect is to give nations permanent rights to orbital claims." Doyle, *supra* note 142, at 16. The users' obvious favor for the non-appropriations clause was apparent by the negative response to the claims by equatorial states to sovereignty over the portions of the orbit in the arcs above their territory. See Arnopolous, *supra* note 147, at 220 (discussing the legal status of the geostationary orbit with respect to the claims of equatorial states).

free access.<sup>162</sup> At one of the first conferences following the ratification of the Outer Space Treaty, it was conceded that "all States [have] an equal right to the use of frequencies and to the use of geostationary orbit. Conversely, no State has or acquires a permanent right to an orbit merely from the fact of having put a satellite into orbit and having occupied certain positions on that orbit."<sup>163</sup> The ITU regulations seem to accord with the principles contained in the Outer Space Treaty.

Traditionally, the key to the ITU's regulatory process has been the coordination of problems arising between users of the geostationary orbit. "The process provided for in the regulations involves three basic steps: (1) advance publication of a proposed satellite system through the IFRB [International Frequency Registration Board], (2) coordination of any identified problems involving other countries, and (3) notification of registry of the system in the International Frequency Register."<sup>164</sup> The plan has been characterized as a *posteriori* approach calling for case-by-case resolution of conflicts or interference by relying on a notice and recordation system.<sup>165</sup> Upon notification of a proposed system under step (1), the IFRB examines the notice and issue findings with regard to conformity with regulations and also with respect to the possibility for harmful interference with existing systems.<sup>166</sup> Generally, the conflict will be resolved in favor of the first user (so long as he also was the first to register). However, a WARC resolution provides that first registration

<sup>162</sup> The U.S. position is that "emphasis should be on constructing a planning approach that gives each nation the access it desires at the time it is ready to implement a system." Anthony M. Rutkowski, *The World Administrative Radio Conference on Use of the Geostationary-Satellite Orbit: Airing the Views of U.S. Regulators and Users*, 24 COLUM. J. TRANSNAT'L L. 51, 59 (1985). In fact, no state has ever been denied access to the orbit. Doyle, *supra* note 142, at 7; see *infra* notes 170-175 and accompanying text (discussing the problem of equitable access).

<sup>163</sup> Bourely, *supra* note 83, at 149 (citing Final Acts of the World Administrative Radio Conference for Space Telecommunications, Resolution Spa 2-1 (Geneva, 1971)).

<sup>164</sup> Doyle, *supra* note 142, at 5.

<sup>165</sup> OTA WARC Report, *supra* note 137, at 71.

<sup>166</sup> Wiessner, *supra* note 90, at 229.

does not create a permanent priority and should not cause an obstacle to the establishment of other space systems.<sup>167</sup>

In practice, no nation has been denied access to the orbit; the effect of the coordination process was generally to wring concessions from the later user.<sup>168</sup> Difficulties arose from inconsistent use of interference standards and from the bilateral nature of the coordination process, which often did not adequately reflect the interests of affected third parties.<sup>169</sup> The Geneva WARC of 1971 first emphasized that space communications were a 'finite natural resource' and that it was necessary to share the resource between countries.<sup>170</sup> During the 1970s, developing nations were disturbed by the results of the coordinating procedure<sup>171</sup> and argued that a planning process based on first-come, first-served was inconsistent with the limited nature of the geostationary resource and the promise of access on an equitable basis.<sup>172</sup> At the 1979 WARC, it was resolved to convene a WARC to guarantee in practice equitable access for all countries.<sup>173</sup> At the 1982 ITU Conference, the developing nations were able to modify the notion of equity in the ITU Conventions to take account for the special needs of developing nations.<sup>174</sup> This seeming gain on the part of the developing nations must be balanced against the provision in the

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<sup>167</sup> Doyle, *supra* note 142, at 6 (citing Resolution 2 of the 1979 WARC).

<sup>168</sup> *Id.* at 7 (noting registration difficulties encountered by India for Intelsat and by Indonesia for Palapa in the mid-1970s). India was required to shift its preferred orbital position by five degrees, restrict the satellites power which resulted in increased costs for the Earth station and to restrict television operations. *Id.* at 8.

<sup>169</sup> *Id.* at 7.

<sup>170</sup> Bourely, *supra* note 83, at 149.

<sup>171</sup> See Doyle, *supra* note 142, at 7-8 (discussing the Indian coordination of Insat with the U.S.S.R).

<sup>172</sup> See Wiessner, *supra* note 90, at 231 (discussing movement by developing states following the 1973 Conference rewriting ITU Convention).

<sup>173</sup> Doyle, *supra* note 142, at 10.

<sup>174</sup> See Milton L. Smith, *Space WARC 1985: The Quest for Equitable Access*, 3 B.U. INT'L L.J. 229, 238 (1985) (providing detailed analysis of the 1973 ITU Convention with reference to 'equity' and 'use').

same Convention that use of the geostationary orbit resource must be made "efficiently and economically."<sup>175</sup>

In 1983 two WARCs were planned (in 1985 and in 1987) to work out a plan for allocation that incorporated the resolutions of previous Conferences, including those with respect to equity.<sup>176</sup> The developed nations and the developing nations had opposing views as to the nature of the plan to be adopted. The developed nations preferred the flexibility of the old process based on case-by-case coordination and first-come, first-served priority.<sup>177</sup> They also favored resolution of conflicts by the conflicting parties focusing on technical issues to avoid protracted political posturing.<sup>178</sup> The United States FCC emphasized that any new or modified arrangements fashioned by the Space WARC must: (1) support the U.S. telecommunications requirements; (2) be compatible with pro-competitive deregulatory policies; (3) encourage efficient use of the orbit/spectrum resource; and (4) not be unnecessarily burdensome or inflexible in allowing innovative services to be introduced.<sup>179</sup> On the other hand, the developing nations favored a rigid *a priori* plan that would guarantee access in the future.<sup>180</sup> The developed nations, while optimistic that all nations may be accommodated in the orbit, feared that the *a priori* planning approach would promote rigid technical specifications and remove incentives for technical innovation. The result of such a plan could be an artificial scarcity in orbit positions and inefficient and inequitable use of the resource in general.<sup>181</sup>

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<sup>175</sup> *Id.* at 241 (citing Article 33 of the 1982 ITU Convention).

<sup>176</sup> Histories of this period and analyses of the 1985 WARC abound. See, e.g., Doyle, *supra* note 127; Milton L. Smith, *Space Law/Space WARC: An Analysis of the Space Law Issues Raised at the 1985 ITU World Administrative Radio Conference on the Geostationary Orbit*, 8 *Hous. J. INT'L L.* 227 (1986); Finch, *supra* note 147; Smith, *supra* note 174; Ronald F. Stowe, *The Legal and Political Considerations of the 1985 World Administrative Radio Conference*, 11 *J. SPACE L.* 61 (1983); Wiessner, *supra* note 89.

<sup>177</sup> OTA WARC Report, *supra* note 137, at 71.

<sup>178</sup> Rutkowski, *supra* note 162, at 65-66.

<sup>179</sup> *Id.* at 58.

<sup>180</sup> OTA WARC Report, *supra* note 137, at 71.

<sup>181</sup> See Rutkowski, *supra* note 162, at 58.

The development of a new plan was completed in 1988.<sup>182</sup> The view of the developed nations, subject to confirmation in practice, appears to have largely prevailed. The plan adopted respects past allocations while providing flexibility for future allocations.<sup>183</sup> The developing countries, however, obtained assurances of equitable access.<sup>184</sup>

The new plan calls for more detailed notification of proposed systems to the ITU and more carefully outlines the nature of harmful interferences. The plan still relies on coordination to harmonize the various users. In converting a national allotment into an actual assignment, coordination and cooperation with existing users is required. A means 'must' be found to make the assignment, but equitable consideration must also be given to the respective stages of development of the systems. Additionally, the state (or international organization) whose allotment is being converted into an assignment must assist in the resolution of incompatibilities. The party responsible for the existing system is required to take all "technically and operationally possible measures to remove incompatibilities to accommodate the new en-

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"Equity is intrinsically an abstract concept that can only be achieved on a case-by-case basis. . . [Furthermore,] a planning approach that protects hypothetical systems in the future at the expense of real systems in the present is not equitable. Equally inequitable would be a planning approach that artificially limits the number of accesses to the orbit to a figure below that which would be feasible in the future when the demand for more intensive use arises."

*Id.* See also *supra* notes 40-42 and accompanying text (discussing the relationship between equity and efficiency).

<sup>182</sup> FINAL ACTS OF THE SECOND SESSION OF THE WORLD ADMINISTRATIVE RADIO CONFERENCE ON THE USE OF GEOSTATIONARY-SATELLITE ORBIT AND THE PLANNING OF SPACE SERVICES UTILIZING IT (ORB-88) (Geneva, 1988) [hereinafter FINAL ACTS] (entered into force March 16, 1990).

<sup>183</sup> Part A of the plan contains national allotments and Part B contains the existing network of systems. An allotment consists of a nominal orbital position, a bandwidth, a service area for national coverage, generalized parameters as described and a predetermined arc. *Id.* at Appendix 30B, at 39. Note that a national allotment under Part A of the plan may still require coordination when the allotment is converted to an assignment. *Id.* at Article L, Addendum, 44.

<sup>184</sup> FINAL ACTS, *supra* note 182, Preamble at I.

trant."<sup>185</sup> This may constitute a mere continuation of the old system coupled with an agreement spelling out the responsibilities of the various parties in the negotiation. The new plan, however, places a burden on the existing operator, presumably a technically advanced nation, to adapt his system somewhat to the new user.<sup>186</sup> The issue of appropriation is dealt with by limiting the time period of any allocation. The plan itself is anticipated to be valid only until 1994.<sup>187</sup> Assignments are only valid for the period of operation claimed in the registration notification, but extensions may be sought and will be viewed favorably.<sup>188</sup> This protects the vested interests of existing users while avoiding the national appropriation issue.<sup>189</sup>

The issue of disposition of allocations was not addressed directly. An exchange of feeder link channels, however, was allowed between Germany and Switzerland for a limited period.<sup>190</sup> Presumably, any exchanges are subject to the approval of the ITU.

### C. ADEQUACY OF CURRENT OR DEVELOPING SPACE LAW FOR THE DEVELOPMENT OF CELESTIAL RESOURCES

The existing treaty law, embodied primarily in the Outer Space Treaty, is either too vague with regard to property rights and uses of space resources or is self-contradictory, as it is the proscription of national appropriation. At best it can be regarded as embodying principles guiding the development of space resources.<sup>191</sup> Being vague with regard to obligations and guarantees, it fails to

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<sup>185</sup> *Id.* at Article L, Addendum, 45.

<sup>186</sup> Under the new system, the coordinator now has leverage, in the form of this obligation, to force concessions from the existing user.

<sup>187</sup> FINAL ACTS, *supra* note 182, art. 11, at 75.

<sup>188</sup> *Id.*

<sup>189</sup> The 1971 Conference specifically noted that use did not result in permanent right. *See supra* text accompanying note 163.

<sup>190</sup> FINAL ACTS, *supra* note 182, Appendix 30A, Article 9A, paragraph 9, at 45.

<sup>191</sup> *See supra* text accompanying notes 86-93.

offer the necessary security required by potential users of space resources that they will benefit by their investments.

The customary law, as developed through practice, is not sufficiently developed to provide a predictable property rights system.<sup>192</sup> The customary law which may have developed as a consequence of the general acquiescence by states to the principles embodied in the Outer Space Treaty is unsatisfactory for the same reason the Treaty itself is unsatisfactory.<sup>193</sup> It is vague and contradictory and provides no predictive capability to potential users.

The practice at geostationary orbit provides some basis for property law in outer space. The ITU has developed a process for allocating resources in outer space that seems to incorporate the first reasonable user concept. Once in possession of an orbit location, the ITU procedure also protects the user against harmful interference—giving the user the power to exclude other users whose activities are incompatible with his own use.<sup>194</sup> However, the possession power (right to use) is for a limited period of time and subject to non-renewal by the ITU.<sup>195</sup> From this, and from the limited allowance for exchanges under the plan,<sup>196</sup> it is clear that the right to dispose remains with the ITU.

With respect to the use of an orbital position, such regulation may be reasonable. The users investment is limited to the satellite itself, which has a limited useful lifetime, and, while certain orbital positions are essential for the effective utilization of the investment, no physical change or improvement has been made in the position itself. In fact, for many users and uses, there is flexibility in the actual position needed to use the system.<sup>197</sup> The characteristics of the geostationary orbit and its uses are not analogous to the situation on celestial bodies. For exam-

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<sup>192</sup> See *supra* text accompanying note 119.

<sup>193</sup> See *supra* text accompanying note 122.

<sup>194</sup> See *supra* text accompanying notes 166-85.

<sup>195</sup> See *supra* text accompanying note 188.

<sup>196</sup> See *supra* text following note 182.

<sup>197</sup> See discussion *supra* at note 152.

ple, in creating a lunar base, the investment may not be limited to the equipment sent to the Moon, but could include modifications to the site as well. Such modifications may be as limited as site preparation for erection of facilities or as extensive as building facilities into the landscape (such as use of excavations as shelters) and the creation of mines. In such situations the limited period of possession and the lack of a power to dispose the property may severely limit the value of any investment and thus limit the incentive for investment.

### III. A PROPOSED SYSTEM OF PROPERTY RIGHTS IN SPACE

The powers necessary to constitute an efficient system of property rights on Earth have been found, by deduction from first principles by political philosophers influential in the development of the Western institutions and from history and practice in the courts, to be the power to exclude, to use, and to dispose.<sup>198</sup> The resulting system is also inherently equitable as it benefits society as a whole and as it protects investments and expectations. This system would remain equitable so long as the initial allocation of any new resource was, and is, not based on mere usurpation of unclaimed property, but is based on investment in the property that adds to its value.<sup>199</sup>

This system of property rights relies on the provision of powers to the holder of the property. The source of the power is ultimately in the state that enforces the liabilities of parties corresponding to the powers of owners: the liability to exclusion, the liability for interference with use, and the liability to respect contracts and to refrain from hindering disposition.<sup>200</sup> This implies that sovereign power is essential to any functioning system of property

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<sup>198</sup> See *supra* Part II.A.

<sup>199</sup> LOCKE, *supra* note 23, at 294. "[H]e, that incloses Land and has a greater plenty of conveniencys of life from ten acres, than he could have from an hundred left to Nature, may truly be said, to give ninety acres to Mankind." *Id.*

<sup>200</sup> See *supra* Part I.A.1.

rights, and in the absence of a general sovereign body, sovereignty is to be found in the nation-state.

How does the extension of man's activities into space and onto the celestial bodies change the basic necessities of an efficient and equitable property rights system? The movement of activities into space affects only the place of activities. The nature of those activities and of the actor remain unchanged. The nature of efficiency and equity are likewise unchanged, and the need for certain securities and guarantees to foster productive activity by man is unchanged. The same property rights system that is most beneficial on Earth will be most beneficial on the celestial bodies.

The principles of the Outer Space Treaty do not necessarily contradict these property concepts. It has already been shown that the notion of property rights, including the power to use and dispose, are not incompatible with the general principles of the Outer Space Treaty.<sup>201</sup> The principle of access in space is also appropriate when properly interpreted.<sup>202</sup> But, in regulating access, governing bodies must make proper account for the use of various portions of space and of the rights of the user to be free of harmful interference.<sup>203</sup> Although the provision of Article II against national appropriation contradicts these property concepts, it is inconsistent with the notions of jurisdiction and ownership found elsewhere in the treaty.<sup>204</sup> This provision should therefore be modified and replaced with a concept of reasonable use or investment.<sup>205</sup> Such a provision should provide for initial allocation of unclaimed property only upon productive use or investment. This would allow for the security of national sovereignty while preventing the non-productive reservation of vast resources by non-users.<sup>206</sup>

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<sup>201</sup> See *supra* text at notes 109-18.

<sup>202</sup> See *supra* notes 97-98 and accompanying text.

<sup>203</sup> See *supra* text at notes 112-15.

<sup>204</sup> See *supra* text at notes 100-04.

<sup>205</sup> See *supra* note 116 and accompanying text.

<sup>206</sup> Once the investment is made, the property would remain in the possession

#### IV. CONCLUSION

This Note sets forth the necessary attributes of an efficient and equitable property system on Earth and has asserted that such a system should be extended into space for the exploitation of celestial resources. Such a system must provide for the allocation of rights, and the power to exclude, use, and dispose of property interests. All of these rights require the protection of sovereign power for the provision of which the nation-state system has been developed and is suited. The current and developing space property law is not completely incompatible with such a system, but is vague and inconsistent. Amendment to that law by practice and by treaty explicitly approving the system of rights is advisable. Such a course of action would not be inconsistent with an Outer Space Treaty amended to substitute a concept of reasonable use as a basis for national appropriation for the no national appropriation provisions of Article II.

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of the investor until disposed of or abandoned. Furthermore, the concept of use would have to include provisions for reasonable growth.

The argument may be made that the abandonment of the no sovereignty in space provision would project the conflicts between nation-states into space. This assumes that conflicts are a result of nation-states. An argument to the contrary, however, is that nation-states were historically a result of conflicts. Man sought to develop the state to provide security in a world of conflict.



# **Comments**

